11

The Claims

1. A method for generating a cloud free and cloud-shadow free image from a plurality of images of a region, the method including the steps of:

(a) ranking pixels in order of cloudiness and shallowness;

(b) using a conditional majority filter on the plurality of images of the region to include as large a patch of neighbouring good pixels from each of the plurality of images as possible;

(c) generating cloud and shadow masks by classifying a group of pixels as cloud, shadow, or noncloud-nonshadow; and

(d) creating a mosaic from the plurality of images to form the cloud free and cloud-shadow free image.

2. A method as claimed in claim 1, wherein each pixel in each of the images is ranked according to predefined ranking criteria, and the highest ranked pixels are used to compose the mosaic.

3. A method as claimed in claim 1 or claim 2, wherein size and shape information of bright pixel clusters are used to discriminate any bright land surfaces and buildings from clouds.

4. A method as claimed in any one of claims 1 to 3, wherein solar illumination direction, sensor viewing direction and typical cloud heights information is used to predict likely locations of cloud shadows.

5. A method as claimed in any one of claims 1 to 4, wherein intensity gradients are used to search for locations of cloud shadows near cloud edges.

6. A method as claimed in claim 5, further including the step of applying a morphological filter to the cloud masks detected by the intensity gradients to locate and include thin clouds around the edges of thick clouds.

7. A method as claimed in any one of claims 1 to 6, wherein the plurality of images is panchromatic satellite images.

12

8.   A method as claimed in any one of claims 1 to 6, wherein the plurality of images is multi-spectral images.

9.   A method as claimed in any one of claims 1 to 8, wherein the highest raking pixels are considered as good pixels and the lowest ranking pixels are considered as bad pixels.

10.   A method as claimed in claim 9, wherein the good pixels are further classified into vegetation pixels and building pixels.

11.   A method as claimed in claim 10, wherein the building pixels include land clearings.

12.   A method as claimed in claim 10 or claim 11, wherein the classification depends on whether the pixel intensity is below or above a threshold for vegetation pixels.

13.   A method as claimed in any one of claims 9 to 12, wherein darker good pixels are preferred over brighter good pixels.

14.   A cloud free and cloud-shadow free image produced by the method of any one of claims 1 to 13.

15.   A computer usable medium having a computer program code which is configured to cause a processor to execute one or more steps to enable a computer to perform the method of any one of claims 1 to 13.

5   **The Claims**

1. A method for generating a cloud free and cloud-shadow fee image from a plurality of images of a region, the method including the steps of:

    (a) ranking pixels in order of cloudiness and shadowness;

10 (b) generating cloud and shadow masks by classifying a group of pixels as cloud, shadow, or noncloud-nonshadow; and

    (c) creating a mosaic from the plurality of images to form the cloud free and cloud-shadow free image.

15 2. A method as claimed in claim 1, wherein each pixel in each of the images is ranked according to predefined ranking criteria, and the highest ranked pixels are used to compose the mosaic.

3. A method as claimed in claim 1 or claim 2, wherein size and shape information of
20 bright pixel clusters are used to discriminate any bright land surfaces and buildings from clouds.

4. A method as claimed in any one of claims 1 to 3, wherein solar illumination direction, sensor viewing direction and typical cloud heights information is used to
25 predict likely locations of cloud shadows.

5. A method as claimed in any one of claims 1 to 4, wherein intensity gradients are used to search for locations of cloud shadows near cloud edges.

30 6. A method as claimed in claim 5, further including the step of applying a morphological filter to the cloud masks detected by the intensity gradients to locate and include thin clouds around the edges of thick clouds.

7. A method as claimed in any one of claims 1 to 6, including the step of using a
35 conditional majority filter in addition to the ranking criteria to include as large a patch of neighbouring good pixels as possible in the generation of the mosaic.

8. A method as claimed in any one of claims 1 to 7, wherein the plurality of images is panchromatic satellite images.

9. A method as claimed in any one of claims 1 to 7, wherein the plurality of images is multi-spectral images.

10. A method as claimed in any one of claims 1 to 9, wherein the highest raking pixels are considered as good pixels and the lowest ranking pixels are considered as bad pixels.

11. A method as claimed in claim 10, wherein the good pixels are further classified into vegetation pixels and building pixels.

12. A method as claimed in claim 11, wherein the building pixels include land clearings.

13. A method as claimed in claim 11 or claim 12, wherein the classification depends on whether the pixel intensity is below or above a threshold for vegetation pixels.

14. A method as claimed in any one of claims 10 to 13, wherein darker good pixels are preferred over brighter good pixels.

15. A cloud free and cloud-shadow free image produced by the method of any one of claims 1 to 14.

16. A computer usable medium having a computer program code which is configured to cause a processor to execute one or more steps to enable a computer to perform the method of any one of claims 1 to 14.